

Progress towards a 1 GeV laser-driven accelerator

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Laser-driven accelerators are being studied as an alternative to more conventional RF-based accelerators. Accelerating gradients as high as a few 100 GV/m have been reported in mm-scale length plasmas, resulting in the acceleration of large amounts of background electrons and ions ($> 10^{10}$ particles per bunch) to multi-MeV energies. Many important challenges remain towards the development of a laser accelerator suitable for high-energy physics research, e.g., production of mono-energetic bunches and extending the acceleration distance to reach 1 GeV electron energies. Our present design for a 1 GeV module consists of an all-optical injector followed by a channel guided laser wakefield stage. Experimental progress at the l'OASIS lab using the 10 TW, 50 fs laser (presently being upgraded to 100 TW) will be presented. In addition, applications will be discussed such as radio-isotope production, generation of coherent far-infrared radiation, and femtosecond x-ray production. This work is supported by DOE under contract DE-AC-03-76SF0098. C. Geddes acknowledges support from the Hertz Foundation.